

Abstract

The invention discloses a data validation, mirroring and error / erasure correction method for the dispersal and protection of one and two-dimensional data at the micro level for computer, communication and storage systems. Each of 256 possible 8-bit data bytes are mirrored with a unique 8-bit ECC byte. The ECC enables 8-bit burst and 4-bit random error detection plus 2-bit random error correction for each encoded data byte. With the data byte and ECC byte configured into a 4 bit x 4 bit codeword array and dispersed in either row, column or both dimensions the method can perform dual 4-bit row and column erasure recovery. It is shown that for each codeword there are 12 possible combinations of row and column elements called couplets capable of mirroring the data byte. These byte level micro-mirrors outperform conventional mirroring in that each byte and its ECC mirror can self-detect and self-correct random errors and can recover all dual erasure combinations over four elements. Encoding at the byte quanta level maximizes application flexibility. Also disclosed are fast encode, decode and reconstruction methods via boolean logic, processor instructions and software table look-up with the intent to run at line and application speeds. The new error control method can augment ARQ algorithms and bring resiliency to system fabrics including routers and links previously limited to the recovery of transient errors. Image storage and storage over arrays of static devices can benefit from the two-dimensional capabilities. Applications with critical data integrity requirements can utilize the method for end-to-end protection and validation. An extra ECC byte per codeword extends both the resiliency and dimensionality.